UNIVERSIDADE ESTADUAL PAULISTA
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Espessura do reto abdominal como fator preditivo da incontinência urinária específica da gestação: estudo ultrassonográfico

Rectus abdominis muscles' thickness as predictive factor of pregnancy specific urinary incontinence: ultrasound study

Dissertação apresentada à Faculdade de Medicina, Universidade Estadual Paulista "Júlio de Mesquita Filho", Campus de Botucatu, para obtençãodo título de Mestre emTocoginecologia.

Orientadora: Prof.ª Dra. Angélica Mércia Pascon Barbosa

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Epígrafe

“E ainda que tivesse o dom de profecia, e conhecesse todos os mistérios e toda a ciência, e ainda que tivesse toda a fé, de maneira tal que transportasse os montes, e não tivesse amor, nada seria.”

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Português e Inglês

Lista de abreviações em Português

AP	assoalho pélvico
CAAE	Certificado de Apresentação de Apreciação Ética
CEP	Comitê de Ética em Pesquisa
DMG	*diabetes mellitus* gestacional
Dra.	doutora
FAMEMA	Faculdade de Medicina de Marília
FAPESP	Fundação de Amparo à Pesquisa do Estado de São Paulo
FEMA	Fundação Educacional do Município de Assis
FMRP	Faculdade de Medicina de Ribeirão Preto
IU	incontinência urinária
IU-EG	incontinência urinária específica da gestação
MAP	músculos do assoalho pélvico
MRA	músculos reto abdominais
PPG	Programa de Pós-graduação
Prof.ª	professora
QV	qualidade de vida
TT3	treinamento técnico 3
UNESP	Universidade Estadual Paulista
US-2D	ultrassonografia bidimensional
USC	Universidade do Sagrado Coração
USP	Universidade de São Paulo

Lista de abreviações em Inglês

%	percentage
3D-US	three-dimension ultrasound
BMI	body mass index
CI	confidence interval
Cm	centimeter
GDM	Gestational Diabetes Mellitus
ICI-Q	International Consultation on Incontinence Questionnaire
ISI	Incontinence Severity Index
Kg	kilogram
LAM	Levator ani muscle
PDRC	Perinatal Diabetes Research Center
PFM	pelvic floor muscles
PFMD	pelvic floor muscle dysfunction
PS-UI	pregnancy specific-urinary incontinence
QOL	quality of life
R	rest
RAM	Rectus abdominus muscle
RR	Relative risk
T	task
UI	urinary incontinence

Sumário

Seção 1
Trajetória Acadêmica

No ano de 2011 dei início à minha formação acadêmica, ingressando no curso de Fisioterapia pela Faculdade de medicina de Ribeirão Preto / Universidade de São Paulo (FMRP / USP). Foram 5 anos de dedicação intensa, estudos, aprendizados, amizades, amadurecimento e a certeza de que ser Fisioterapeuta foi uma escolha certa.

Durante a graduação, sempre fui apaixonada pela área da Saúde da Mulher, me envolvendo nos minicursos e palestras, chegando a participar da gestão da Liga de Fisioterapia na Saúde da Mulher no ano de 2013 em que auxiliei como secretária na organização de eventos voltados para a área.

Logo no primeiro ano de formada, realizei pós graduação pela Universidade do Sagrado Coração (USC – Bauru) em Fisioterapia em Dermatofuncional e Saúde da Mulher, em que tive a oportunidade de me aprofundar nos estudos. Após alguns anos, me mudei para Marília e de imediato entrei em contato com a Profa Angélica demonstrando meu interesse na área e meu desejo em continuar estudando, aprendendo e me formando para a área acadêmica, uma vez que após experiência profissional ministrando cursos na área de Dermatofuncional para laboratório, me encontrei na área da comunicação aflorando meu desejo de lecionar.

Por um ano, antes de entrar oficialmente no PPG em Tocoginecologia como mestranda, fiz parte do grupo participando ativamente das reuniões, treinamentos e coletas o que permitiu a realização deste mestrado em um período de 12 meses.

Assim, em 2021 iniciei o mestrado pelo Projeto Temático Fapesp DIAMATER, "*The Diamater Study Group*", sob a orientação da Profª Drª Angélica Mércia Pascon Barbosa e coorientação da Profa. Dra. Natália Miguel Martinho Fogaça. Ao longo desse ano, além de dar seguimento ao meu projeto, tive a oportunidade de participar de eventos internacionais (Anexo 1) como "*Diabetes, Obesity and Pregnancy Outcomes*", "*Obesity Inflammasome as a Risk for Developing Gestational Diabetes*" e "*Placental Adaptation in Gestational Diabetes and Obesity*" e de ser contemplada com uma bolsa Treinamento Técnico 3 (TT3) da

FAPESP (Anexo 2), tendo como título do projeto “Treinamento para avaliar pela ultrassonografia bidimensional a diástase do músculo reto abdominal de mulheres com incontinência urinária específica da gestação” sob orientação da Profª Drª Angélica Mércia Pascon Barbosa.

Foi possível ainda colaborar em 5 artigos, sendo um publicado e demais em fase de submissão para revistas de alto impacto, que não compõe o corpo dessa dissertação, intitulados:

1. *Effectiveness of the pelvic floor muscle training on muscular dysfunction and pregnant specific urinary incontinence in pregnant women with gestational diabetes mellitus: A systematic review protocol (Anexo 3)*
2. *“Pelvic floor muscle dysfunction in third trimester of pregnancy and long-term postpartum is related with Gestational Diabetes Mellitus: Levator hiatal area 3D-US assessment.”*
3. *“Dynamic Model for Pelvic Floor Muscles Assessment by Transperineal Ultrasonographic: A New Approach of the Diamater Study Group”.*
4. *“The Role of Gestational Diabetes Mellitus and Pelvic Floor 3D-ultrassound Markers at the Second and Third Trimester of Pregnancy Predicting 6-18 months postpartum Urinary Incontinence: A Risk Model Constructed by Multivariate Logistic Regression Analysis”.*
5. *“Incidence and risk factors for long-term Urinary Incontinence in a cohort of early and late-onset Gestational Diabetes compared to non-Gestational Diabetes: a nested case-control study”*

Meu propósito após a conclusão do mestrado é continuar me aprimorando e adquirindo conhecimento constante em prol da saúde das nossas mulheres, fazendo a diferença no cenário acadêmico e científico e, por isso, o desejo de dar continuidade aos estudos por meio do Doutorado.

Seção 2
Contextualização

Músculos abdominais e do assoalho pélvico e sua relação com a Incontinência Urinária Específica da Gestação

A cavidade abdominopélvica é formada por músculos, ossos e estrutura aponeuróticaque circunda os órgãos pélvicos e abdominais. Dentre os músculos que compõe esta região,encontram-se os músculos Reto Abdominais (MRA) que inserem-se em estruturas ósseas da pelve, onde se encontram os músculos do Assoalho Pélvico (MAP), que estão predominantementeenvolvidos na estabilização lombo-pélvica e continência urinária (1-7).

Para que a função de continência urinária ocorra de maneira satisfatória, a musculatura envolvida precisa apresentar uma performance adequada por meio de uma dinâmica abdomino-pélvica equilibrada que é dependente da posição anatômica, a qualidade das fibras musculares e a integridade das fáscias.

A relação funcional entre os MAP e músculos abdominais (transverso do abdômen, oblíquos interno e externo e reto abdominal) foi primeiramente descrita por Sapsford e colaboradores (3, 8).Portanto, para que estes músculos desempenhem suas funções de continência e sustentação, parece haver a necessidade de que durante as contrações de MAP ocorra também a contração dos músculos abdominais (5) e vice-versa, atuação esta denominada cocontração sinérgica (9). Alguns estudos mostram ainda que a contração simultânea do abdômen parece potencializar a atividade motora do MAP (4, 5 e 7), mostrando importância deste grupo muscular na função de continência urinária (10).

De forma semelhante, durante situações de aumento da pressão intra-abdominal, faz-se necessário que ocorra interação entre os músculos abdominais e os MAP, dissipandoa pressão dentro do recinto abdominal. Os MAP, por sua vez, também devem contrair sinergicamente com a musculatura do tronco. Com a incoordenação destes músculos,

ocorre aumento da atividade muscular dos músculos da parede abdominal superior, o que faz com que as vísceras sejam empurradas contra o assoalho pélvico. Ou seja, o aumento da pressão intra-abdominal mais a insuficiência dos MAP, predispõe às disfunções pélvicas (2).

A cocontração sinérgica entre MAP e musculatura abdominal é observada em mulheres assintomáticas (11 e 12), porém não há consenso na literatura a respeito das mulheres com Incontinência Urinária (IU) (12, 13 e 14). O que tem sido sugerido entre alguns autores (14 – 18) é que os sintomas miccionais estejam possivelmente relacionados a um desequilíbrio na ação destes dois grupos musculares, seja através de uma resposta muscular dos MAP inferior à musculatura abdominal e/ou seja através de uma lentidão no tempo de ativação dos MAP em relação à ativação abdominal (6, 19 – 21).

Evidências de revisão sistemática demonstraram que a interação dos MAP com os músculos abdominais ocorre tanto na contração voluntária do assoalho pélvico quanto nas manobras abdominais e que o MRA deve participar dos mecanismos de continência urinária (22).

Durante a gravidez, o corpo da gestante passa por diversas adaptações fisiológicas. Como consequência ao permitir o crescimento uterino, há estiramento do músculo abdominal, ocorrendo uma separação dos feixes dos MRA em relação a linha Alba, podendodar origem à diástase do músculo reto abdominal, considerado patológico quando o afastamento é superior a três centímetros (23,24). Sua modificação de comprimento pode resultar em alteração em sua capacidade de produzir o torque, interferindo no vetor de força muscular (25) e repercutindo negativamente no pós-parto (23).

O assoalho pélvico (AP) também passa por adaptações no período gestacional. Na fáscia endopélvica, responsável pela sustentação dos órgãos acima do assoalho pélvico, ocorrem modificações em seu componente principal, o colágeno (26). A fraqueza nas estruturas do AP é comumente encontrada na gravidez levando à predisposição de disfunção e seus sintomas consequentes (27). A massa corporal materna e o peso uterino

geram sobrecarga na musculatura do assoalho pélvico (28). Como forma de compensaçãoa esse aumento na carga, foi observado tônus muscular maior para manter as funções de suporte e continência (29). Além disso, o sobrepeso excessivo pode resultar em aumento na tensão excedente enfraquecendo as estruturas musculares e suscitando disfunções pélvicas (30-32).

A presença de IU com primeira ocorrência durante gravidez, denominada IU específica da gravidez (IU-EG) (33), tem impacto negativo na qualidade de vida (QV) aolongo do tempo (33, 34), com prevalência média de 41% em mulheres grávidas. Mesmo que ainda não inteiramente compreendida a fisiopatologia da IU-EG, a literatura traz como causa as alterações mecânicas e hormonais ocorridas neste período (33). Além disso, IU-EG é fator de risco para a IU 2 anos após o parto em que foi observado menorcontração dos músculos do assoalho pélvico (MAP) (35) nesse período o que nos remeteàs suas consequências a longo prazo.

Pesquisas com associação entre *Diabetes Mellitus* Gestacional (DMG) e alteraçãomuscular iniciaram-se a partir de investigações clínicas sobre IU gestacional em mulheres com histórico de DMG. A literatura científica tem mostrado o impacto negativoda hiperglicemia no músculo: atrofia e desorganização muscular, diminuição da proporção de fibras rápidas, aumento da deposição de colágeno e fibrose severa foram observados em um estudo realizado em ratas grávidas diabéticas (36,37), evidenciandoque o DMG altera o músculo esquelético pelo efeito direto da hiperglicemia (38). Sendo assim, surgiu a tríade DMG, miopatia diabética e IU e seus biomarcadores, que é investigada pelo *Diamater Study Group* desde 2006, caracterizando o Projeto Temático (2016/01743-5). O *Conceptual Model* (36), estabelecido da integração entre DMG, IU- EG e miopatia hiperglicêmica tem a funcionalidade dos MAP e MRA como variáveis moderadoras e precisa ser investigado (Figura 1).

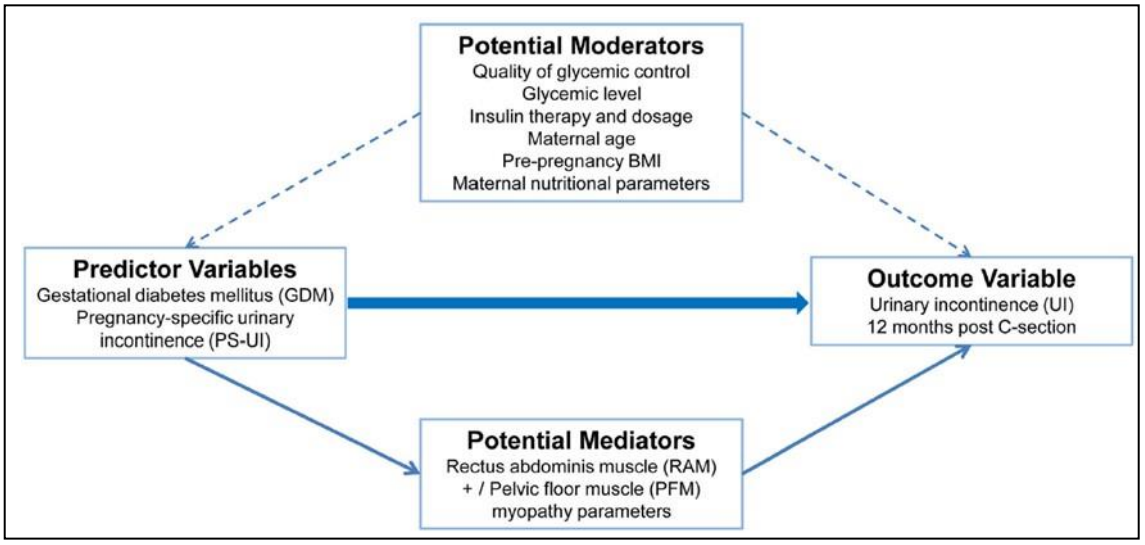

Figura 1: Potenciais confundidores, mediadores e moderadores do Diamater. Fonte**:**Rudge et al., 2020 (36).

Com o objetivo de subsidiar os estudos futuros da relação DMG, IU-EG e co- contração MAP e MRA e comparar achados, faz-se necessário como base o conhecimento das possíveis alterações na sinergia muscular em gestantes normoglicêmicas com IU-EG.

Com base nesses fatos, a avaliação da funcionalidade do MRA pode ser realizadaatravés da ultrassonografia bidimensional (US-2D), uma vez que esta técnica tem sido relatada como método simples, não invasivo, de fácil execução e amplamente utilizado na clínica obstétrica (39). A técnica está prontamente disponível, não tem radiação ionizante, apresenta desconforto mínimo (40), tem boa confiabilidade interobservador e interdisciplinare permite avaliação dinâmica dos músculos (41). Sendo assim, é possível obter imagens de maneira rápida e de fácil aprendizado pelos pesquisadores clínicos (42-46). Ajustes nas zonas focais para a área de interesse (profundidade de 2 a 5 cm) e no software para melhorar a qualidade das imagens são necessários (46-48). As imagens da US-2Dpermitem análise anatômica do MRA em qualquer região de sua extensão durante repouso e análises funcionais durante sua ativação por meio de tarefas solicitadas ao compararmos

a espessura anteroposterior entre os momentos da mesma participante e sua relação entreos grupos de interesse na pesquisa (Figura 2).

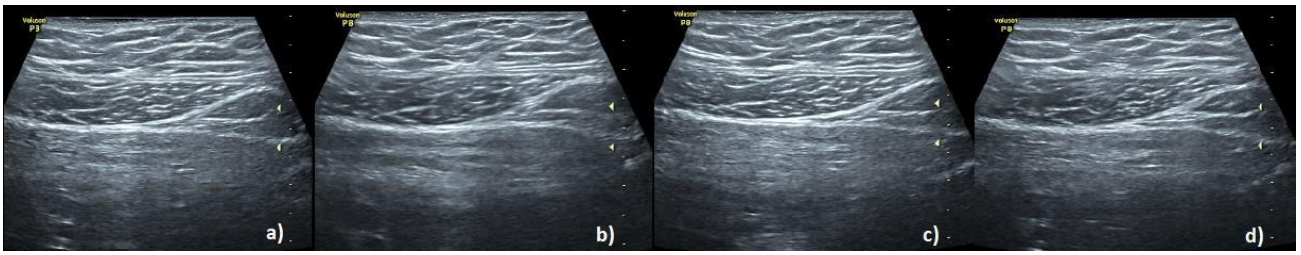

Figura 2- Imagem de US-2D do MRA. Arquivo do DIAMATER, 2018.

A presente Dissertação se propõe responder perguntas previstas nos objetivos do “Projeto Temático Diamater”. Tem aprovação do Comitê de Ética em Pesquisa (CEP) para seu desenvolvimento no projeto “mãe” CAAE: 82225617.0.0000.5411 (Anexo 4). O objetivogeral a saber, é: Identificar a espessura/funcionalidade do músculo reto abdominal avaliada por ultrassonografia 2D durante exercícios voluntários e a cocontração associada dos músculos do assoalho pélvico como preditor da incontinência urinária específica da gravidez.

Os resultados obtidos estão apresentados no artigo de acordo o respectivo objetivo:

- *Rectus abdominis muscles functionality assessed by two-dimensional ultrasound asa predictor of the pregnancy-specific urinary incontinence.*

Sendo assim, não apenas para responder às perguntas do Projeto Temático Diamater, o trabalho também se justifica por ter sido aplicado metodologias de análise inéditas na área, complementando a abordagem de problemática de interesse médico/sociale pelo conhecimento da incontinência urinária específica da gestação ser um problema de saúde pública que afeta a qualidade de vida da mulher com impactos maternos a longo prazo.

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Seção 3
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Rectus abdominis muscles functionality assessed by two-dimensional ultrasound as a predictive factor of the pregnancy-specific urinary incontinence

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Abstract

Objective: to identify the change in the rectus abdominis muscle thickness during both isolated and simultaneous abdominal and pelvic floor muscles' contractions; as well as to compare the rectus abdominis muscle thickness between pregnant women with and without pregnancy-specific urinary incontinence (PS-UI).

Design: A cross-sectional study.

Setting: Research Center of Botucatu Medical School.

Participants: Pregnant women from 19 weeks of gestation with and without PS-UI were recruited.

Main Outcome Measures: Rectus abdominis muscle (RAM) thickness measured at rest and during RAM contraction, pelvic floor muscle (PFM) contraction and simultaneous RAM and PFM contraction.

Results: One hundred twenty-seven pregnant women with PS-UI and 62 pregnant women without PS-UI were included. Pre-gestational BMI and gestational BMI were higher on PS-UI group, while educational level was lower in this group. RAM thickness was greater in the PS-UI group when measured at rest and during isolated voluntary contractions of both RAM and PFM. Thickening of the RAM from rest and during an isolated RAM voluntary contraction was greater in the PS-UI group. Control group presented greater strength and longer duration of contraction maintenance (endurance) of Pelvic Floor Muscles (PFM).

Conclusion: Higher education levels and physical activity during pregnancy were shown to be protective factors. Higher pre-pregnancy BMI, higher gestational BMI, and higher RAM thicknesses at rest, during isolated RAM voluntary contraction, during PFM isolated voluntary contraction and its greater variation values were shown to be risk factors for PS-UI.

Introduction

Muscles that compose the pelvic floor surrounds urethra, vagina and anus, connecting the pelvic ring. They are collectively referred to as the levator ani and coccygeus muscles. Their two major functions are providing support for pelvic organs and maintaining the continence mechanism. When healthy, these muscles are symmetrical and able to contract and relax voluntarily and involuntarily; as well as contracting in response to the intra-abdominal pressure increasing. On the other hand, if there is a disorder affecting their ability to contract, relax and/or distend, affecting also their muscle control and coordination will predispose to Pelvic Floor Muscle Dysfunctions (PFMD) (1-4). PFMD present negative impact on quality of life (5-7) and are associated with symptoms of stress urinary incontinence, overactive bladder syndrome, pelvic organ, anal incontinence, pelvic pain, sexual dysfunction and constipation (8-11).

When healthy, they are symmetric, can contract voluntarily or involuntarily, can relax and it must response to the increases of intra- abdominal pressure. When there is a disorder that affects ability to contract, distend, relax, control and coordinate pelvic floor muscles, it is called Pelvic Floor Muscle Dysfunction (PFMD) (1-4), it results negative impact on quality of life (5-7) and is associated with symptoms urinary incontinence, stress urinary incontinence, overactive bladder syndrome, pelvic organ, anal incontinence, pelvic pain, sexual dysfunction and constipation (8-11).

Pelvic floor and abdominal muscle cocontraction have been functionally justified due to the positioning of the fibers (12). It appears to be necessary the action of these muscles to occur in a coordinated manner to maintain urinary continence since their simultaneous contraction seems to potentiate the motor activity of both. In other words, the contraction of abdominal muscles improves the functionality of the pelvic floor (13-15) showing its importance in the role of the urinary continence function (16).

Urinary incontinence (UI) is defined by the International Continence Society as any involuntary leakage ofurine (17). There is still no consensus in the literature whether women with UI have or not a synchronous pelvic floor and abdominal muscles response (16,18,19). Some authors (19-23) suggest that the presence of voiding symptoms is related to the uncoordinated action between these muscles. Evidence from a systematic review has shown the interaction of pelvic floor muscles with the abdominal muscles during the isolated voluntary contraction of both and that the rectus abdominis muscle must participate in the mechanisms of urinary continence (24).

The presence of urinary incontinence with first occurrence during pregnancy is known as Pregnancy Specific-Urinary Incontinence (25) and it has a negative impacton quality of life (25, 26) with an average prevalence of 41% in pregnant women. The pathophysiology is not entirely known, but literature has brought the mechanical and hormonal adaptations as cause (25). During pregnancy, as a consequence of allowing uterine growth, there is a stretching of the abdominal muscle and this length modification may interfere in the muscle strength vector (27). Collagen modifications, maternal body mass, uterine weight and the commonly weakness on pelvic floor found on pregnant women may lead to pelvic floor dysfunctions (3,28,29).

Therefore, the maintenance of urinary continence mechanisms seems to depend on the adequate performance of all the muscles involved, their anatomical position, the quality of their fibers (active support) and the integrity of the fascia (passive support).

Ultrasonographic has been reported as a simple and safety way to assess thickness of rectus abdominus muscle on pregnant women, in any region of its extension during rest or dynamic activities and it has good interobserver and interdisciplinary reliability (30,31).

The aim of the present study was to identify the change in the rectus abdominis muscle thickness during both isolated and simultaneous abdominal and pelvic floor muscles' contractions; as well as to compare the rectus abdominis muscle thickness between pregnant women with and without pregnancy-specific urinary incontinence (PS-UI).

Methods

A cross-sectional study was conducted at the Perinatal Diabetes Research Center (PDRC), São Paulo State University (UNESP), Botucatu Medical School, Brazil, by the Diamater Study Group. The STROBE statement was used as a guide to report this study. Pregnant women from 19 weeks of gestation were recruited from November 2018 to February 2020. This study was approved by the Institutional Ethical Committee of Botucatu Medical School, São Paulo State University (UNESP), Botucatu, São Paulo State, Brazil (CAAE: 82225617.0.0000.5411). Women were invited to participate during the waiting room at PDRC. All participants provided written informed consent according to the ethical guidelines (Resolution 466/2012) of the Brazilian Health Council, prior data collection.

Participants

The inclusion criteria were pregnant women from 19 weeks of gestation, at least 18 years of age and singleton pregnancy. Participants who had urinary incontinencebefore pregnancy, previous known to have diabetes or diagnosis of gestational diabetes, neurological disorders, prolapse, inability to perform the correct Pelvic Floor Muscles (PFM) contraction, limitations that prevented full or partialcompletion in any time of this study, preterm birth and intrauterine fetal death, were excluded.

Sample size calculation

We considered the observational, cross-sectional study and data from previous studies, specific to the research group, which showed PS-UI in 31.6% in normoglycemic pregnant women. With a significance level of 95% and statistical sample power of 80% (1-beta, probability of detection), at least 40 participants were included in each of the groups.

The study was composed of two groups: PS-UI group and Control group.

Data collection

In a private office at PDRC, were collected the following demographic information: maternal age, ethnicity, education level, smoking in pregnancy, physical activity, pre-pregnancy and body mass index (BMI) at collect.

PS-UI diagnosis and classification

Participants were asked whether during pregnancy they had leaked or lost control of even a small amount of urine with activity such as coughing, lifting, or exercise or if they experienced an urge to urinate and could not go to the toilet fast enough (urge UI). Pregnant women who reported Pregnancy-specific urinary incontinence (PS-UI) were asked to complete the Brazilian version of the International Consultation on Incontinence Questionnaire-Urinary Incontinence- Short Form (ICIQ- SF) (32) The participants were also asked about the frequency and quantity of urinary leakage to assess the validated Incontinence Severity Index (ISI). The severity was graded depending on the frequency of leakage (grade I: once a week at most; grade II: two or more episodes per week, but not daily and grade III: one or more episodes of leakage per day) according to ISI questionnaire (33).

RAM's thickness and PFM cocontraction

The participant was requested to stand in dorsal decubitus with lower limbs in extension. The ultrasound used was a GE® brand portable equipment with 2D image acquisition. The transducer used was Linear with a frequency of 8 to 12 Mhz .

All participantswere instructed about how to perform the following sequence: rest, RAM contration and PFM contraction.The technique of PFM contraction was explained by this verbal prompt:"Please squeeze your pelvic muscle, as though you were trying to hold in gas and ashard as you can, maintaining it as long as possible" (34). A PFM contraction wasconsidered correct when the examiner observed the best cranial shift of the levator animuscle (LAM) and when felt inward pressure or upward traction on the finger insertedin the vagina (35).RAM contraction was requested through trunk elevation. The 2D-US was performed by an experienced investigator on 2D-US. Anatomical and functional images of the lower right portion of the RAM were collectedto measure its anteroposterior thickness where the transducer was positioned transversely 2 cm above and to the right of the upper edge of thepubic symphysis. The images were collected in four steps and then saved anonymously in the following sequence (Figure 1):

1. One image of RAM at rest to compare with the functional images (Figure 1a).
2. One image of RAM during a voluntary contraction with trunk elevation (Figure 1b).
3. One image of RAM while the participantvoluntary contracts PFM to verify the RAM response to this demand (Figure 1c).
4. One image of RAM during voluntary contractions of PFM and RAM (Figure

1d).

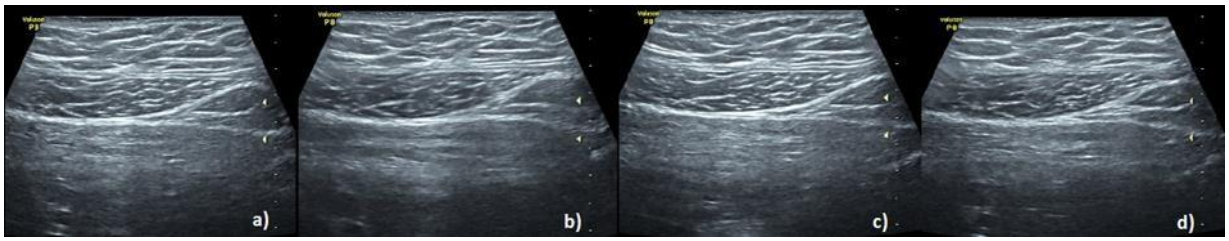

Figure 1 – Ultrasound images of RAM. Researchers' archive, 2018.

All of the images were coded by, keeping the patient's identification anonymous and stored for further offline analysis, which guarantees the analysis in a single-blind way.

The thickness were measured by the distance between the deep and superficial fascias of the RAM, assessed 3 cm from the medial edge of the rectus abdominis muscle. The index considering resting state was calculated for each task (T) separately (RAM, PFM contraction and cocontraction) by subtracting the thickness from the thickness at rest (Index=T–R). The smaller the value obtained for contraction, the lower the capacity tocontract RAM during the task in relation to rest.

Statistical methods

The software IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, N.Y., USA) was used to statistical analysis. Categorical variables were expressed as numbers and percentages and continuous variables were expressed by mean and standard deviation.The Chi-square test or Fisher's exact test was applied to compare the nominal data between groups. Comparisons between groups were performed by Mann-Whitney U test. Differences were considered statistically significant at $p < 0.05$. Poisson regression model was adopted to evaluate the association between the risk factors and pregnancy-specific urinary incontinence considering $p < 0,20$ statistically

significant.

Results

A total of 217 pregnant women met the inclusion criteria and completed all stages of the research. Among these, 28 participants were excluded from the final analysis: 7 due to missing data and 21 due to technical fail during US analysis. Thus, 189 participants were successfully included in this study, of these, 62 were enrolled for the control group and 127 were enrolled for the PS-UI group (Figure 2).

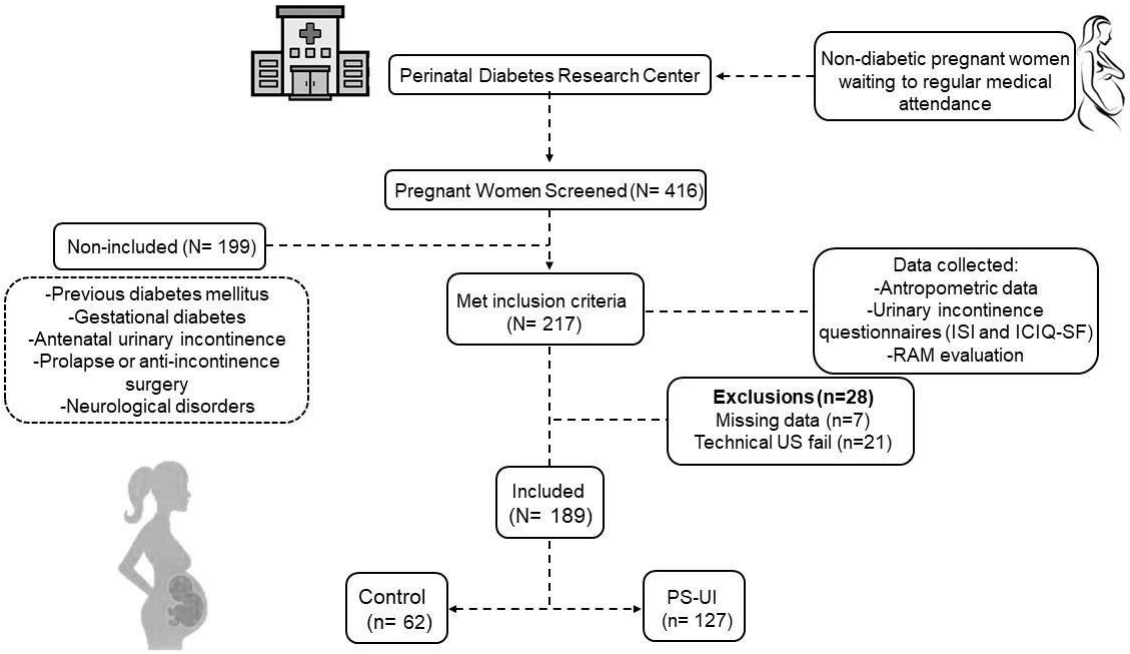

Figure 2 – Flowchart for cohort derivation showing the number of participants and the reasons for loss.

The baseline characteristics of 189 participants are summarized on Table 1. The groups were matched for age, gestational age, maternal weight gain and previous C-section. Pre-gestational BMI and gestational BMI were higher on PS-UI. Education level was lower on PS-UI when to compare with Control group (Table 1).

Table 1: Baseline characteristics of the study population

Variables	Control (n=62)	PS-UI (n=127)	p-value
Age (years)	26.56±6.18	25.93±5.57	*.548*
Pre-pregnancy BMI (kg⁄m²)	25.16±6.22	27.48±7.38	*.012*
Gestational age (weeks)	28.44±4.67	28.83±4.88	*.540*
BMI gestational (kg⁄m²)	27.90±4.89	30.00±6.89	*.019*
Weight gain (kg)	7.11±8.64	6.68±7.53	*.699*
Primiparous	44 (71.0%)	81 (63.8%)	0.413
Prior cesarean delivery	18 (29%)	46 (36.2%)	0.413
Education level			*0.004*
Middle school	2 (3.2%)	23 (18.1%)	
High school	40 (64.5%)	80 (63.0%)	
Higher education	20 (32.3%)	24 (18.9%)	

n: sample. The chi-square test or Fisher's exact test; $p < 0.05$ significant difference between the groups.

Table 2 presents muscle's variables in the PS-UI compared to Control group. The thickness of the RAM at rest, in the isolated voluntary contraction of the RAM and in the isolated voluntary contraction of the PFM was greater in the PS-UI group when compared to the Control group. The variation of RAM thickness in cm, considering rest as baseline, was greater in the PS-UI group during isolated RAM voluntary contraction.

Table 2 – Rectus abdominis muscle (RAM) thickness during different tasks.

Variables	Control (n=62)	PS-UI (n=127)	p-value
RAM thickness			
At Rest (cm)	0.57±0.14	0.61±0.13	*.035*
During RAM contraction (cm)	0.73±0.24	0.83±0.23	*.007*
During PFM contraction (cm)	0.60±0.16	0.65±0.14	*.019*
During Cocontraction (RAM+PFM) (cm)	0.78±0.24	0.81±.023	*.507*
Thickness Variation Index (cm) - considering the rest status			
RAM contraction (cm)	0.16±0.15	0.22±0.18	*.043*
PFM contraction (cm)	0.02±0.05	0.03±0.09	*.655*
Cocontraction (RAM+PFM) (cm)	0.20±0.15	0.19±0.18	*.482*
ThicknessVariation Index (%) - considering the rest status			
RAM contraction (%)	26.53±23.62	37.15±34.43	*.059*
PFM contraction (%)	4.02±8.46	6.81±19.88	*.657*
Cocontraction (RAM+PFM) (%)	34.99±26.47	33.05±31.41	*.405*

n: sample; BMI: body mass index; kg: kilograms; RAM: rectus abdominis muscle; PFM: pelvic floor muscle; cm: centimeter; %: percentage. PS-UI: incontinence urinary group. Index-considering the rest state was calculated by (the task – Rest); Percentage-considering the rest state was calculated by ((the task – rest)/ rest*100). Data are presented in mean ± standard deviation. Mann-Whitney U test; $p < 0.05$ significant difference between the groups.

Table 3 shows the predictors for PS-UI through bivariate linear regression analysis. According to the findings, higher education levels are protective factors: severity index of PS-UI were lower at higher levels when compared to lower levels of education. Physical activity during pregnancy was presented as a protective factor. Higher pre-pregnancy BMI and higher gestational BMI are risk factors for UI-PS.

Higher RAM thicknesses at rest, during isolated RAM voluntary contraction and during PFM isolated voluntary contraction, as well as its greater variation in absolute and percentage values were shown to be risk factors for PS-UI.

Table 3 – Bivariate linear regression of predictors for PS-UI.

Variables	RR	CI 95%	p-value
Primiparous	0.932	0.809	.326
Prior cesarean delivery	1.073	0.932	.326
Education level			
Higher education	0.688	0.550	.001
High school	0.776	0.638	.012
Non-Caucasian	1.014	0.862	.866
Physical activity	0.843	0.688	.099
Smoking	0.874	0.657	.356
Age (years)	0.996	0.984	.475
Gestational age	1.004	0.990	.598
Pre-pregnancy BMI	1.010	1.001	.032
BMI gestational	1.012	1.001	.030
Weight gain (kg)	0.998	0.990	.724
RAM thickness during task			
Rest (cm)	1.582	0.974	.064
RAM contraction (cm)	1.453	1.102	.008
PFM contraction (cm)	1.603	1.018	.042
Cocontraction (RAM+PFM) (cm)	1.126	0.842	.424
Variation Index (cm)-considering the rest state			
RAM contraction (cm)	1.515	1.036	.032
PFM contraction (cm)	1.245	0.548	.601
Cocontraction (RAM+PFM) (cm)	0.924	0.626	.691
Variation Index (%) -considering the rest state			
RAM contraction (%)	1.002	1.000	.028
PFM contraction (%)	1.002	0.998	.287
Cocontraction (RAM+PFM) (%)	1.000	0.997	.672

CI:confidence interval; RR: relative risk; RAM: rectus abdominis muscle; PFM: pelvic floor muscle; cm: centimeter; %: percentage. Index-considering the rest state was calculated by (the task – Rest); Percentage-considering the rest state was calculated by ((the task – rest)/ rest*100). Poisson regression analysis; $p < 0,20$

Discussion

By demonstrating the positive correlation between the thickness of the Rectus Abdominis and the cross-sectional area as a metric measure of muscle size (36), it is possible to correlate the findings of the present study with the functionality of the muscle in the PS-UI compared to control group.

Having rest as a baseline for inter- and intra-group comparison, 2D US allows the evaluation of muscle behavior through the variation in thickness that can change according to the requested task, providing clinical information about the muscle contraction capacity (37). In this study, the PS-UI group showed a thicker Rectus Abdominis at rest and a higher BMI. Studies such as Rankin et al (38) and Springer et al (39) showed a positive correlation between BMI and abdominal muscle thickness.

Differences in thickness could represent improvement or deterioration in muscle contraction (40). Thicker RAM in the PS-UI group may be related to muscle hypertrophy, or in other words, greater contraction demand when compared to the control group.

The abdominal musculature plays an important role in the urinary continence function (41), since its joint action with the PFM (cocontraction) seems to potentiate the motor activity of the PF (42-44). Thicker RAM during PFM isolated voluntary contraction in the PS-UI group, which presented lower strength and endurance, may be a form of compensation or muscle reinforcement when trying to potentiate PFM activity. However, the situation of increased intra-abdominal pressure added to PFM insufficiency predisposes to pelvic dysfunction (45) which would explain the thicker RAM in isolated voluntary contractions of RAM and PFM and its greater variation in these tasks in relation to rest, as a risk factor for PS-UI

Coldron (46) in its study associated the reduction in the thickness of the RAM to the decrease in strength. By following this reasoning, inversely, the increase in thickness would be related to the increase in strength and when associating with the results of the present study, the RAM in the PS-UI group would present greater strength compared to the control. However, Baran (47) brings in its study the weaknessof the RAM as a potential factor associated with UI during pregnancy.

In agreement with the study by Barbosa (48), high BMI proved to be a risk factor for UI during pregnancy, with higher rates when compared to control group. Maternal body mass and uterine weight generate an overload on the PF muscles (49). Excessive overweight can result in an increase in excess tension, weakening muscle structures and triggering pelvic dysfunction (50-52). Luber (53) also shows that the risk increases in proportion to the increase in BMI.

The PF muscles have continence as one of the main functions, therefore, good strength and endurance are essential muscle factors for adequate performance. Lower strength and PFM endurance were present in the PS-UI group compared to control. Hilde (54) in its review also brings up such relationship. Thus, PFM insufficiency, in this study, when classified as “weak” or “flicker” in muscle strength, proved to be a riskfactor for UI during pregnancy, while greater endurance proved to be a protective factorin maintaining strength.

Menezes and (55) Tamanini (56) in their studies with non-pregnant women, also observed an association between schooling and urinary incontinence, being more present in women with less time of study. Little access to information and health centers can justifysuch a relationship since there are no physiological precedents.

Study limitations and strengths

We must consider some limitations of this study. Ideally, all pregnant women should have been assessed before pregnancy. Nevertheless, this study is the first report assessments that allowed us to evaluate impacts since the pregnancy.

The examiner who analyzed the ultrasonographic data sets and images was blinded and the results were reviewed by a second investigator.

Conclusion

Higher education levels and physical activity during pregnancy were shown to be protective factors.

Higher pre-pregnancy BMI, higher gestational BMI, and higher RAM thicknesses at rest, during isolated RAM voluntary contraction, during PFM isolated voluntary contraction and its greater variation values were shown to be risk factors for PS-UI.

Keywords

Urinary incontinence; Rectus Abdominis Muscle; Pregnancy; 2D Ultrasonographic; Contraction; Pelvic Floor Muscle

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***List of Abbreviations*:**

% **percentage**
3D-US three-dimension ultrasound
BMI **body mass index**
CI **confidence interval**
Cm **centimeter**
GDM **Gestational Diabetes Mellitus**
ICI-Q **International Consultation on Incontinence Questionnaire**
ISI **Incontinence Severity Index**
Kg **kilogram**
LAM **Levator ani muscle**
PDRC **Perinatal Diabetes Research Center**
PFM **pelvic floor muscles**
PFMD **pelvic floor muscle dysfunction**
PS-UI **pregnancy specific-urinary incontinence**
QOL **quality of life**
R **rest**

RAM **Rectus abdominus muscle**
RR **Relative risk**
T **task**
UI **urinary incontinence**

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Seção 4
Perspectivas Acadêmicas e Científicas

Pensar nas perspectivas nesta fase final do mestrado, me fez rever todo o processo vivido até aqui e me estimulou ainda mais a cumprir esta etapa que é tão tensa e que exige dedicação, às vezes, até além da nossa capacidade. A formação no mestrado até o momento, fortaleceu e ampliou a perspectiva de iniciar a carreira docente e de pesquisadora.

Para a continuidade da busca do conhecimento e na colaboração para melhorar a assistência a mulher, a proposta é permanecer como aluna de Doutorado, com início em março de 2022, na mesma linha de pesquisa desta trajetória e continuar colaborando na composição dos biomarcadores funcionais da miopatia diabética e da IU-EG como preditoras da IU pós-parto de gestantes com DMG.

Sinto-me honrada em continuar fazendo parte do *Diamater Study Group!*

Espero poder levar o conhecimento e principalmente beneficiar as mulheres, ao longo desta nova etapa da minha vida.

Seção 5

Diamater Study Group

Abaixo segue nominalmente o grupo Diamater

Pesquisadores Nacionais

Profa. Emérita Marilza Vieira Cunha Rudge
Profa. Titular Iracema de Mattos Paranhos Calderon
Profa. Dra. Angélica Mérica Pascon Barbosa
Profa. Dra. Fátima Pereira de Souza
Prof. Titular Carlos Frederico de Oliveira Graeff
Prof. Titular Manoel João Batista Castello Girão
Profa. Dra. Cláudia Garcia Magalhães
Prof. Dr. Roberto Antonio de Araujo Costa
Profa. Adjunto Silvana Andréa Molina Lima
Profa. Dra. Meline Rossetto Kron Rodrigues
Prof. Adjunto Sérgio Luis Felisbino
Prof. Dr. Walnei Fernandes Barbosa
Profa. Dra. Grasiela Bossolan
Prof. Dr. José Eduardo Corrente
Prof. Dr. Hélio Rubens de Carvalho Nunes
Prof. Dr. Joelcio Francisco Abbade
Profa. Dra Patrícia de Souza Rossignoli
Profa. Dra. Cristiane Rodrigues Pedroni
Prof. Titular Álvaro Nagib Atallah
Profa. Dra. Zsuzsanna Ilona K. de Jarmy Di Bella
Profa. Silvana Maria de Macêdo Uchôa
Prof. Titular Marco Antonio Hungaro Duarte
Prof. Dr. Edson Assunção Mareco
Profa. Adjunta Marna Eliana Sakalem
Profa. Dra. Natalia Miguel Martinho Fogaça
Prof. Dr. Diego Girotto Bussaneli
Profa. Titular Maeli Dal Pai
Profa. Dra. Selma Maria Michelin Matheus
Profa. Dra. Ana Karina Cristiuma De Luca
Profa. Dra. Daisy Maria Fávero Salvadori
Prof. Dr. Rondinelli Donizetti Herculano
Prof. Dr. Spencer Luiz Marques Payao

Pesquisadores Internacionais

PhD Adonis Hijas
PhD Luis Sobrevia Luarte
PhD Bary Berghmans
PhD Rob de Bie
PhD Costanza Emanueli
PhD Baerbel Junginger
PhD Antonio Musàro
PhD Lehana Thabane

Pesquisadores Associados

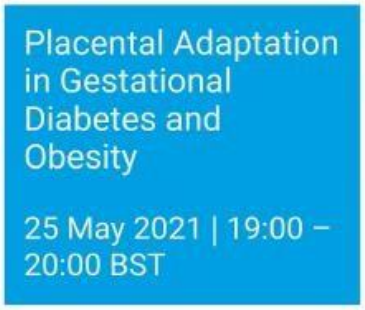
PhD Raghavendra Hallur Lakshmana Shetty
PhD David Rafael Abreu Reyes
Dra Fernanda Cristina Bérgamo Alves
Dr João Paulo de Castro Marcondes
Dra Maíra Libertad Soligo Takemoto
Dra Juliana Ferreira Floriano
Dra. Fernanda Piculo
Dra. Gabriela Marini Prata
Dra Cibele Vieria Cunha Rudge
Dr. Fabio Joly Campos
Dr. Ícaro Putinhon Caruso
Dr. Lucas Trevizani Rasmussen
Dr Vinícius Krieger Costa Nogueira
Ms. Caroline Baldini Prudencio
Ms. Fabiane Affonso Pinheiro
Ms. Carlos Izaias Sartorão Filho
Ms. Sofia Beatriz Carolina Vega Quiroz
Ms. Tawana Pascon
Ms. Sthefanie Kenickel Nunes
Ms. Bruna Bologna Catinelli
Ms. Fabiana Vieira Duarte de Souza Reis
Ms. Rafael Guilen de Oliveira
Ms. Sarah Maria Barneze Costa
Ms. Mariane de Oliveira Menezes
Ms. Nilton José dos Santo
Ms. Isabella Otenio de Lourenço
Ms. Jéssica Maróstica de Sá
Ms. Raissa Escandiusi Avramidis
Ms Guilherme Thomaz de Aquino Nava
Ms Talita Costa Domingues
Eusebio Mario Amador Enriquez
Jose Vitor Freitas Melo (*in memoriam)*
Luiz Takano
Aline Medolago Carr
Gabriela Azevedo Garcia
Adriely Bittencourt Morgenstern Magyori
Carolina Neiva Frota de Carvalho
Luana Fávaro Iamundo
Henrique Caetano Mingoranci Bassin
Carolina Neiva Frota de Carvalho
Carolina Pascon Marques
Michele Jacomin
Ana Julia Bimbatti Silva
Maiara Isabele Gonçalves Orlandi
Tatiana Daniele Dangió

Apoio à Pesquisa
Rita de Cássia Athanázio
Cinthia Scolastico Cecilio


VANS

Seção 6
Anexos

Anexo 1 – Participação em eventos internacionais



To Whom It May Concern,

Certificate of Attendance

This is to certify
that Adriely Morgenstern attended the 'Placental Adaptation in Gestational Diabetes and Obesity' webinar on **25 May 2021**.

Yours faithfully,
The Physiological Society

To Whom It May Concern,

Certificate of Attendance

This is to certify
that Adriely Morgenstern attended the 'Obesity Inflammasome as a Risk for Developing Gestational Diabetes' webinar on
27 April 2021.

Yours faithfully,
The Physiological Society

Physiological Society

To Whom It May Concern,

Certificate of Attendance

This is to certify
that Adriely Morgenstern attended the 'Diabetes, Obesity and Pregnancy Outcomes' webinar on
29 June 2021.

Yours faithfully,
The Physiological Society

Anexo 2 – Concessão Bolsa Treinamento Técnico

FAPESP SAGe

Processo

Identificação do Processo

Número do Processo	2021/04296-8 - BCO - Treinamento Técnico
Situação	Em Execução
Grupo de Financiamento	Bolsa no País
Linha de Fomento	Bolsas Concedidas como Itens Orçamentários em Auxílios / BCO - Treinamento Técnico - Fluxo Contínuo
Beneficiário	Adriely Bittencourt Morgenstern Magyori
Responsável	Angélica Mércia Pascon Barbosa
Data Início	01/05/2021
Duração	11 mês(es)
Período Total Usufruído	7 mês(es) / 10 dia(s)
Período Total Interrompido	-

Instituição de Pesquisa/Empresa	Faculdade de Medicina de Botucatu/FMB/UNESP
Departamento	Ginecologia e obstetricia
Data de Abertura	29/04/2021

Processo Vinculado

Número	Linha de Fomento	Beneficiário	Responsável	Título
2016/01743-5	Projeto de Pesquisa - Temático	Mariza Vieira Cunha Rudge	Mariza Vieira Cunha Rudge	Coorte da tríade gestacional hiperglicemia, incontinência urinária e perfil clínico, molecular e ômico da miopatia hiperglicêmica na predição de incontinência e disfunção muscular e pesquisa translacional com biodevice para regeneração muscular em ratas.

Resumo

Introdução: O grupo de pesquisa "Diabetes e Gravidez - Clínico e Experimental" da Faculdade de Medicina de Botucatu-Unesp, investiga desde 2006, a fisiopatologia de diabete gestacional (DMG) e da hiperglicemia gestacional leve (HGL) e suas relações com as disfunções musculares do assoalho pélvico (DMAP) e incontinência urinária (IU) em estudos clínicos e experimentais. Após análise crítica no grupo e com parceiros nacionais e internacionais dos resultados obtidos, verificaram-se grandes lacunas que precisam ser preenchidas com estudos pré-clínicos e clínicos mais complexos. Objetivos: Analisar a influência da associação entre hiperglicemia gestacional (HGG) considerando DMG e HGL, "IU específica da gestaçao" ("IUEG") e perfil (morfológico, funcional, bioquímico, molecular e ômico) da "miopatia hiperglicêmica gestacional" ("MHG") do músculo reto abdominal (MRA) e músculos do assoalho pélvico (MAPs); analisar a tríade HGG, "IUEG" e perfil da "MHG", a incidência de IU 6-12 meses pós-parto (PP) e perfil morfológico, funcional e bioquímico, dentro das quatro coortes constituídas pela combinação entre HGG e "IUEG"; avaliar o efeito do biodevice de látex de seringueira com células-tronco mesenquimais na regeneração do músculo uretral e do MRA após cesárea em ratas prenhes com diabete moderado no perfil morfológico, microvascular, molecular e ômico; e determinar a evidência científica, por meio da revisão sistemática, da efetividade dos exercícios sobre a DMAP e "IUEG" em gestantes com HG. Materiais e Métodos: No estudo clínico, as participantes serão selecionadas entre janeiro 2016 e dezembro de 2019 no Centro de Investigação do Diabete Perinatal da FMB UNESP, no Ambulatório de Gestação de Risco do Hospital Materno Infantil da FAMEMA e no Hospital Regional de Assis. O total de participantes será de 160 considerando as quatro coortes que serão constituídas. Será realizada análise do perfil bioquímico, obtido pelas análises sanguíneas dos níveis de CCL7, Relaxina, Ca, PTH, calcitonina, vitamina D, glicose e insulina; nos MAPs, serão realizados a Avaliação Funcional do Assoalho pélvico (AFA), Eletromiografia (EMG) e Ultrassonografia (US), nos MRA serão realizados EMG e US, no momento da cesárea a contratilidade ex vivo obtida pelo Miógrafo, e os perfis morfológico (ultraestrutura das fibras musculares e da matriz extracelular), molecular (Expressão Gênica e Proteica das fibras musculares e da matriz extracelular), e Ômico (transcriptômica, proteômica e metabolômica). Para o estudo experimental, serão utilizadas ratas Wistar prenhes, divididas em grupos (n=20 cada) não diabéticas e diabéticas, que serão submetidas à instalação do biodevice de biomembrana de látex revestida de células-tronco mesenquimais, implantados na musculatura estriada uretral e MRA. O estudo de Revisão Sistemática seguirá as normas e será registado na Colaboração Cochrane. Na análise estatística com o software SPSS v21.0, as relações serão consideradas estatisticamente significativas de $p < 0,05$. Resultados esperados: Caracterizar a "MHG"; que a tríade proposta seja preditora de IU e DMAP 6-12 meses PP; definir marcadores para diagnóstico e em futuras terapias; evidenciar a primeira linha de intervenção preventiva ou reabilitadora para as disfunções musculares e "IUEG"; que a "IUEG" na HGG seja considerada e incluída como um problema de saúde pública e como intercorrência clínica, passando a representar uma nova ferramenta na definição do impacto materno de longo prazo; que o biodevice seja considerado para regeneração da musculatura em futuros estudos clínicos; e que esta abordagem translacional proposta trará esta pesquisa para a fronteira do conhecimento na área de Saúde da Mulher, uma vez que estão sendo aplicadas metodologias de análise inéditas na área que se complementam na abordagem de problemática de interesse médico/social.

Anexo 3 – Artigo publicado em periódico

PLOS ONE

REGISTERED REPORT PROTOCOL

Effectiveness of the pelvic floor muscle training on muscular dysfunction and pregnancy specific urinary incontinence in pregnant women with gestational diabetes mellitus: A systematic review protocol

Angélica Márcia Pascon Barbosa[1☯†], Eusebio Mario Amador Enriquez[1☯‡], Meline Rossetto Kron Rodrigues[1☯], Caroline Baldini Prudencio[1☯], Alvaro Nagib Atallah[2☯], David Rafael Abreu Reyes[3☯], Raghavendra Lakshmana Shetty Hallur[4☯], Sthefania Kenickel Nunes[3☯], Fabiana Affonso Pinheiro[3☯], Carlos Isaias Sartorão Filho[3☯], Gabriela Lopes Piemonte Andrade[3☯], Bary Berghmans[5☯], Rob de Bie[6☯], Silvana Andréa Molina Lima[1☯¶], Marilza Vieira Cunha Rudge[7☯¶], The Diamator Study Group[¶]

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☯ These authors contributed equally to this work.
‡ AMPB and EMAE are first authors on this work. SAML and MVCFR are last authors on this work.
¶ Membership of The Diamator Study Group is listed in the Acknowledgments.
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Citation: Barbosa AMP, Enriquez EMA, Rodrigues MRK, Prudencio CB, Atallah AN, Reyes DRA, et al. (2020) Effectiveness of the pelvic floor muscle training on muscular dysfunction and pregnancy specific urinary incontinence in pregnant women with gestational diabetes mellitus: A systematic review protocol. PLoS ONE 15(12): e0241962. https://doi.org/10.1371/journal.pone.0241962

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Abstract

Background

There is ample evidence that gestational diabetes mellitus has a direct influence on urinary incontinence and pelvic floor muscles. There are no standardized pelvic floor muscle exercise programs in the literature for the physiotherapy and differ in the type of exercise, intensity, type and duration of application, and the frequency and duration of treatment sessions. The aim of this systematic review will be to investigate that Pelvic Floor Muscle Training can prevent and/or decrease the pregnancy specific urinary incontinence in women with gestational diabetes mellitus or gestational hyperglycemia.

Methods

We will perform a systematic review according to the Cochrane methodology of Randomized Controlled Trials. An overall search strategy will be developed and adapted for Embase, MEDLINE, LILACS, and CENTRAL databases, with the date of consultation until

UNESP -FACULDADE DE MEDICINA DE BOTUCATU

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Projeto Mãe: Estudo de coorte prospectivo: nova tríade gestacional (hiperglicemia, incontinência urinária e perfil clínico, molecular e ômico da miopatia hiperglicêmica) na predição de incontinência. Pesquisa translacional com biodevice para regeneração muscular em ratas com diabetes

Subprojeto 1: Relação dos achados eletromiográficos dos músculos do assoalho pélvico com os níveis de relaxina ao longo da gestação e após o parto de mulheres com hiperglicemia gestacional e incontinência urinária específica da gestação (Orientador: Marilza Vieira Cunha Rudge/ Orientando: Caroline Baldini Prudencio/ Nível: Doutorado)

Subprojeto 2: Ultrassonografia Tridimensional do assoalho pélvico de mulheres com hiperglicemia gestacional 16-18 meses após a gestação (Orientador: Marilza Vieira Cunha Rudge/ Orientando: Carlos Izaias Sartorão Filho/ Nível: Doutorado);

Subprojeto 3: Coorte prospectiva da tríade hiperglicemia gestacional, incontinência urinária específica da gestação e disfunção muscular do assoalho pélvico, avaliada pela ultrassonografia funcional, como preditora da incontinência urinária e disfunção muscular 6-18 meses após o parto (Orientador: Marilza Vieira Cunha Rudge/ Orientando: Fabiane Affonso Pinheiro/ Nível: Doutorado)

Pesquisador: Marilza Vieira Cunha Rudge
Área Temática:
Versão: 2
CAAE: 62225617.0.0000.5411
Instituição Proponente: Departamento de Ginecologia e Obstetrícia
Patrocinador Principal: FUNDACAO DE AMPARO A PESQUISA DO ESTADO DE SAO PAULO

DADOS DO PARECER

Número do Parecer: 2.511.990

Apresentação do Projeto:
Trata-se de um projeto temático com 03 subprojetos.
Projeto Mãe: Estudo de coorte prospectivo: nova tríade gestacional (hiperglicemia, incontinência urinária e perfil clínico, molecular e ômico da miopatia hiperglicêmica) na predição de

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Anexo 4 - Aprovação Comitê de Ética em Pesquisa